HYPERVELOCITY IMPACT
PROCEEDINGS OF THE 1989 SYMPOSIUM

Contents

Norman Jones	vii	Editorial
Charles E. Anderson, Jr.	ix	Preface
D. Alwes	1	Columbus-viewport glass pane hypervelocity impact testing and analysis
James A. Ang	23	Impact flash jet initiation phenomenology
J. R. Asay and T. G. Trucano	35	Studies of density distributions in one-dimensional shock-induced debris clouds
J. R. Asay, T. G. Trucano and R. S. Hawke	51	The use of hypervelocity launchers to explore previously inaccessible states of matter
L. M. Barker, L. C. Chhabildas, T. G. Trucano and J. R. Asay	67	High gas pressure acceleration of flier plates—experimental techniques
D. J. Cagliostro, D. A. Mandell, L. A. Schwalbe, T. F. Adams and E. J. Chapyak	81	MESA 3-D calculations of armor penetration by projectiles with combined obliquity and yaw
A. C. Charters, T. L. Menna and Andrew J. Piekutowski	93	Penetration dynamics of rods from direct ballistic tests of advanced armor components at 2–3 km/s
L. C. Chhabildas, L. M. Barker, J. R. Asay and T. G. Trucano	107	Relationship of fragment size to normalized spall strength for materials
Eric L. Christiansen	125	Investigation of hypervelocity impact damage to space station truss tubes
Burton G. Cour-Palais and Jeanne Lee Crews	135	A multi-shock concept for spacecraft shielding
J. H. Cuadros	147	Monolithic and segmented projectile penetration experiments in the 2 to 4 kilometers per second impact velocity regime
S. A. Finnegan, J. C. Schulz and O. E. R. Heimdahl	159	Spatial fragment mass and velocity distributions for ordnance and ultra-ordnance speed impacts
L. Erik Fugelso, James N. Albright, Gerald C. Langner and Kerry L. Burns	171	A hypervelocity projectile launcher for well perforation
Lewis A. Glenn	185	Design limitations on ultra-high velocity projectile launchers

D. E. Grady and S. L. Passman	197	Stability and fragmentation of ejecta in hypervelocity impact
Arthur L. Gurson	213	The effect of geometric scale on impact induced fragmentation, and its application to the design of dual plate armor
Kathleen S. Holian	231	Hydrodynamics code calculations of debris clouds produced by ball–plate impacts
P. M. Holland, J. T. Gordon, T. L. Menna and A. C. Charters	241	Hydrocode results for the penetration of continuous, segmented and hybrid rods compared with ballistic experiments
V. D. Hopper, D. K. B. Sewell and D. K. Aitken	251	Study of melt produced bodies observed at Henbury crater region
G. C. Idzorek, P. W. Keaton, G. L. Stradling, M. T. Collopy, H. L. Curling, Jr. and D. B. McColl	261	Data acquisition system for a hypervelocity-micro-particle-impacts laboratory
H. Iglseder and E. Igenbergs	271	Crater morphology at impact velocities between 8 and 17 km/s
Gordon R. Johnson, Robert A. Stryk, Tim J. Holmquist and Omar A. Souka	281	Recent EPIC code developments for high velocity impact: 3D element arrangements and 2D fragment distributions
P. W. Keaton, G. C. Idzorek, L. J. Rowton, Sr., J. D. Seagrave, G. L. Stradling, S. D. Bergeson, M. T. Collopy, H. L. Curling, Jr., D. B. McColl and J. D. Smith	295	A hypervelocity-microparticle-impacts laboratory with 100-km/s projectiles
J. C. Keith and N. E. Banks	309	Hypervelocity impact and aerodynamic breakup of liquids
R. W. Klopp, D. A. Shockey, J. E. Osher and H. H. Chau	323	Characteristics of hypervelocity impact debris clouds
R. Jeffery Lawrence	337	Enhanced momentum transfer from hypervelocity particle impacts
J. M. McGlaun, S. L. Thompson and M. G. Elrick	351	CTH: a three-dimensional shock wave physics code
J. K. Meier	361	The sensitivity of an Eulerian hydrocode impact analysis to user-selected impact parameters
Robert W. Meier	375	Effects of parametric variations of complex targets on damage from projectile impact
Roger W. Melin	389	Hypervelocity impact testing of heat pipe samples

S. Miller	403	A new design criteria for explosively-formed hypervelocity projectile (EFHP)
P. Naz and H. F. Lehr	413	The crater formation due to segmented rod penetrators
D. L. Orphal and R. R. Franzen	427	Penetration mechanics and performance of segmented rods against metal targets
J. Osher, R. Gathers, H. Chau, R. Lee, G. Pomykal and R. Weingart	439	Hypervelocity acceleration and impact experiments with the LLNL electric guns
Andrew J. Piekutowski	453	A simple dynamic model for the formation of debris clouds
J. J. Pyun, C. M. Kennedy and D. Hruska	473	A new slideline/eroding algorithm for EPIC2
Z. Rosenberg, E. Marmor and M. Mayseless	483	On the hydrodynamic theory of long-rod penetration
Daniel R. Scheffler and Jonas A. Zukas	487	Numerical simulation of segmented penetrator impact
E. Schneider, A. Stilp, R. Bureo and M. Lambert	499	Micrometeorite and space debris simulation for Columbus hull components
William P. Schonberg	509	Hypervelocity impact response of spaced composite material structures
Yasuki Adachi, Hideshige Ohtaki, Fumio Suehiro and Yujiro Shiral	525	Micrometeoroid and debris impact test on space station bumper
Omar A. Souka	535	An automated microcomputer system for analyzing shaped-charge jet radiographs
A. J. Stilp, V. Hohler, E. Schneider and K. Weber	543	Debris cloud expansion studies
G. L. Stradling, G. C. Idzorek, P. W. Keaton, J. K. Studebaker, A. A. Hopkins Blossom, M. T. Collopy, H. L. Curling, Jr. and S. D. Bergeson	555	Searching for momentum enhancement in hypervelocity impacts
William J. Sommers, Jr. and Ken Dent	571	Liquid-filled pellet phenomenology
H. F. Swift	579	On predicting projectile breakup during thin plate impact
T. G. Trucano, D. E. Grady and J. M. McGlaun	587	Fragmentation statistics from Eulerian hydrocode calculations

T. G. Trucano and J. M. McGlaun 601 Hypervelocity impact calculations using CTH: case studies

Peter Tsou 615 Intact capture of hypervelocity projectiles

629 Attendees—Hypervelocity Impact Symposium

635 Author Index

637 Subject Index